

REMARKS

The present application was filed on July 22, 2003 with claims 1-21. In the outstanding Office Action dated August 27, 2004, the Examiner has: (i) rejected claims 1, 3, 5, 6, 8, 10-13, 15, 16 and 18-21 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Publication No. US 2004/0001427 to Belotserkovsky et al. (hereinafter “Belotserkovsky”), in view of the paper N. Kataoka et al., “Adaptive Equalizer Including Frequency-Offset Compensator for Multi-Carrier Communication Systems,” IEEE Symposium on PIMRC ‘98, Vol. 3, pp. 1076-1080, September 1998 (hereinafter “Kataoka”); (ii) rejected claims 2, 7, 9, 14 and 17 under §103(a) as being unpatentable over Belotserkovsky, in view of Kataoka and Terry et al., “OFDM Wireless LANs: A Theoretical and Practical Guide,” Sams Publishing, ISBN 0-672-32157-2, Ch. 2, December 2001 (hereinafter “Terry”); and (iii) indicated that claim 4 contains allowable subject matter.

In this response, Applicant traverses the §103(a) rejections and respectfully requests reconsideration of the present application in view of the following remarks.

Claims 1, 3, 5, 6, 8, 10-13, 15, 16 and 18-21 stand rejected under §103(a) as being unpatentable over Belotserkovsky in view of Kataoka. With regard to independent claims 1, 13 and 21, which are of similar scope, the Examiner contends that Belotserkovsky discloses all of the elements set forth in the subject claims, except “a demodulator configurable for receiving a passband signal” (Office Action; page 2, last paragraph). However, the Examiner further contends that “the functionality of elements 28-34 are the same” (Office Action; page 2, last paragraph). Applicant respectfully disagrees with the Examiner’s contentions.

Claims 1, 13 and 21 are clearly distinguishable from the prior art of record. Specifically, Belotserkovsky is directed to a method for reducing adjacent channel interference in an OFDM receiver. The method taught by Belotserkovsky monitors an “error metric” and the frequency of the desired channel is slowly adjusted in response to the error metric (Belotserkovsky; page 1, paragraph [0009]). The methodology taught by Belotserkovsky is not reasonably analogous to the claimed invention, which relates to estimating carrier frequency offset (CFO) in a wireless communication system. Belotserkovsky defines adjacent channel interference as the interchannel interference resulting from “windowing that occurs as an inherent part of the Fast Fourier Transform (FFT) processing of signals that is typical of all OFDM receivers” (Belotserkovsky; page 1, paragraph

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[0007]). The claimed invention, in contrast, is not directed to errors resulting from the FFT process, but rather relates to an entirely different problem, namely, estimating CFO, which “generally arises when the demodulation carrier frequency does not exactly match the modulating carrier frequency” (Specification; page 2, lines 4-5).

With regard to claim 1, Applicant asserts that Belotserkovsky fails to teach or suggest “a carrier frequency offset (CFO) compensation circuit configurable for receiving the baseband signal and modifying a phase of the baseband signal in response to a first control signal,” as recited in claim 1. The Examiner contends that the CFO compensation circuit set forth in claim 1 is analogous to the carrier frequency adjustment module 64 shown in FIG. 3 of Belotserkovsky (Office Action; page 3, first paragraph). Applicant respectfully disagrees with this contention. The carrier frequency adjustment module 64 taught by Belotserkovsky fails to disclose any mechanism for modifying a phase of the baseband signal, as required by claim 1, and is thus not analogous to the CFO compensator circuit set forth in claim 1. Instead, Belotserkovsky states that the function of the carrier frequency adjustment module 64 is to introduce interbin interference into the input signal by changing the frequency offset (Belotserkovsky; page 2, paragraph [0026]). Consequently, the carrier frequency adjustment module taught by Belotserkovsky cannot reasonably be analogized to the CFO compensation circuit recited in claim 1. Moreover, the prior art of record fails to supplement the deficiencies of Belotserkovsky in at least this regard.

Claim 1 is further distinguishable from the prior art of record in that the prior art fails to teach or suggest a CFO estimation circuit configurable for measuring a difference in phase error between at least two symbols received from the equalizer and for generating the first control signal which is representative of the phase error difference, as required by claim 1. The Examiner contends that the CFO estimation circuit set forth in claim 1 is analogous to the error metric computation module 72 shown in FIG. 3 of Belotserkovsky (Office Action; page 3, first paragraph). Applicant respectfully disagrees with this contention. The error metric computation module 72 taught by Belotserkovsky fails to disclose any mechanism for measuring a difference in phase error between at least two symbols, as required by claim 1, and is thus not analogous to the CFO estimation circuit set forth in claim 1. Rather, Belotserkovsky states that the function of the error metric computation module 72 is to generate an error metric which is “proportional to the adjacent channel interference

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in the input signal 62” (Belotserkovsky; page 2, paragraph [0028]; emphasis added), which is clearly distinguishable from the claimed invention. Accordingly, the error metric computation module taught by Belotserkovsky cannot reasonably be analogized to the CFO estimation circuit recited in claim 1.

Furthermore, while the Kataoka reference may disclose one method for compensating frequency offset in an OFDM system, Kataoka fails to explicitly teach or suggest using a CFO estimation circuit in a feedback configuration for modifying the phase of the baseband signal in response to a measured phase error difference, as required by claim 1. Instead, Kataoka, with reference to FIG. 5, discloses an adaptive equalizer including frequency-offset compensation, wherein the estimated value of frequency offset is supplied not to a CFO compensation circuit, as in the claimed invention, but rather to a Discrete Fourier Transform (DFT) block for demodulating (Kataoka; p. 1078, second column, first paragraph). The prior art of record thus fails to supplement the deficiencies of Belotserkovsky in at least this regard.

For at least the reasons set forth above, Applicant submits that independent claims 1, 13 and 21 are patentable over the prior art of record. Accordingly, favorable reconsideration and allowance of claims 1, 13 and 21 are respectfully solicited.

With regard to claims 3, 5, 6, 8 and 10-12, which depend from claim 1, and claims 15, 16 and 18-20, which depend from claim 13, Applicant submits that these claims are also patentable over the prior art at least by virtue of their dependency from their respective base claims. Moreover, one or more of these claims define additional patentable subject matter in their own right. For example, claims 11, as well as claim 19 which is of similar scope, further defines the first control signal generated by the CFO estimation circuit as being based at least in part on “a difference between the data sample in the expected constellation and the sample in the measured signal constellation.” While the Examiner contends that this feature is disclosed in Kataoka, “whereby a difference is equivalent to a phase change” (Office Action; page 4, paragraph 4), Applicant respectfully disagrees with this contention and asserts that Kataoka fails to disclose any comparison of a data sample in an expected constellation with the data sample in the measured signal constellation corresponding thereto, as set forth in claims 11 and 19. Claims 3, 5, 6, 8, 10-12, 15, 16 and 18-20 are therefore believed to be patentable over the prior art, not merely by virtue of their dependency from their

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respective base claims, but also in their own right. Accordingly, favorable reconsideration and allowance of claims 3, 5, 6, 8, 10-12, 15, 16 and 18-20 are respectfully requested.

Claims 2, 7, 9, 14 and 17 stand rejected under §103(a) as being unpatentable over Belotserkovsky, in view of Kataoka and Terry. While disagreeing with the Examiner's contention that Kataoka and Terry supplement the deficiencies of Belotserkovsky, Applicant asserts that claims 2, 7 and 9, which depend from claim 1, and claims 14 and 17, which depend from claim 13, are also patentable over the prior art at least by virtue of their dependency from their respective base claims. Moreover, one or more of these claims define additional patentable subject matter in their own right. Accordingly, favorable reconsideration and allowance of claims 2, 7, 9, 14 and 17 are respectfully solicited.

In view of the foregoing, Applicant believes that claims 1-21, which are currently pending in the present application, are in condition for allowance, and respectfully requests withdrawal of the §103 rejections.

Respectfully submitted,



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